Energy Technologies Area Lawrence Berkeley National Laboratory

Energy Efficiency EM&V Basics and Issues

Steven R. Schiller, Senior Advisor/Affiliate

Lawrence Berkeley National Laboratory

http://emp.lbl.gov

srschiller@lbl.gov

Presentation for:
Kentucky EM&V Stakeholder Meeting #1
December 9, 2015
Frankfort, Kentucky

MEEA
Midwest Energy Efficiency Alliance

DEDI

Introduction

LBNL is supported by the U.S. Department of Energy to conduct non-classified research, operated by the University of California

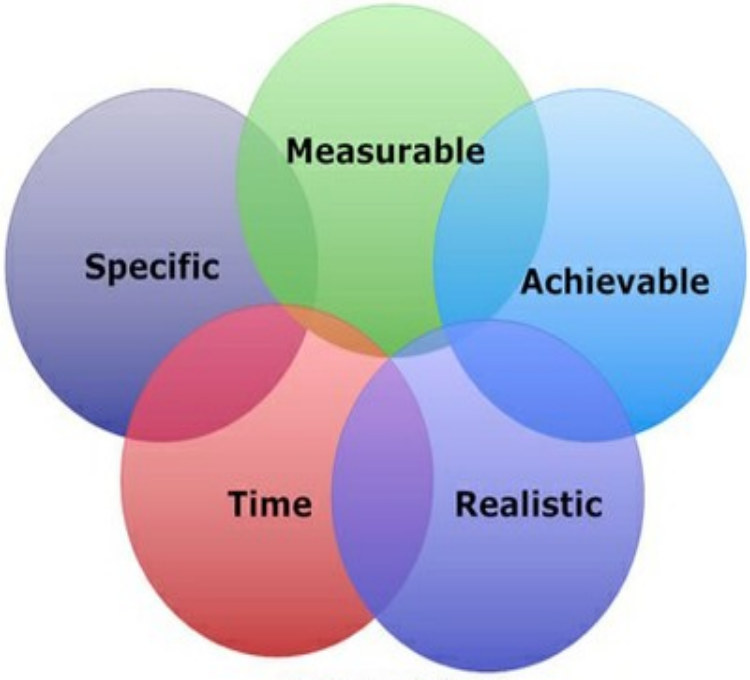
- Provides technical assistance to states—primarily state energy offices and utility regulatory commissions
- Assistance is independent and unbiased

The presentation was funded by the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability-National Electricity Delivery Division under Lawrence Berkeley National Laboratory Contract No. DE-AC02-05CH11231.

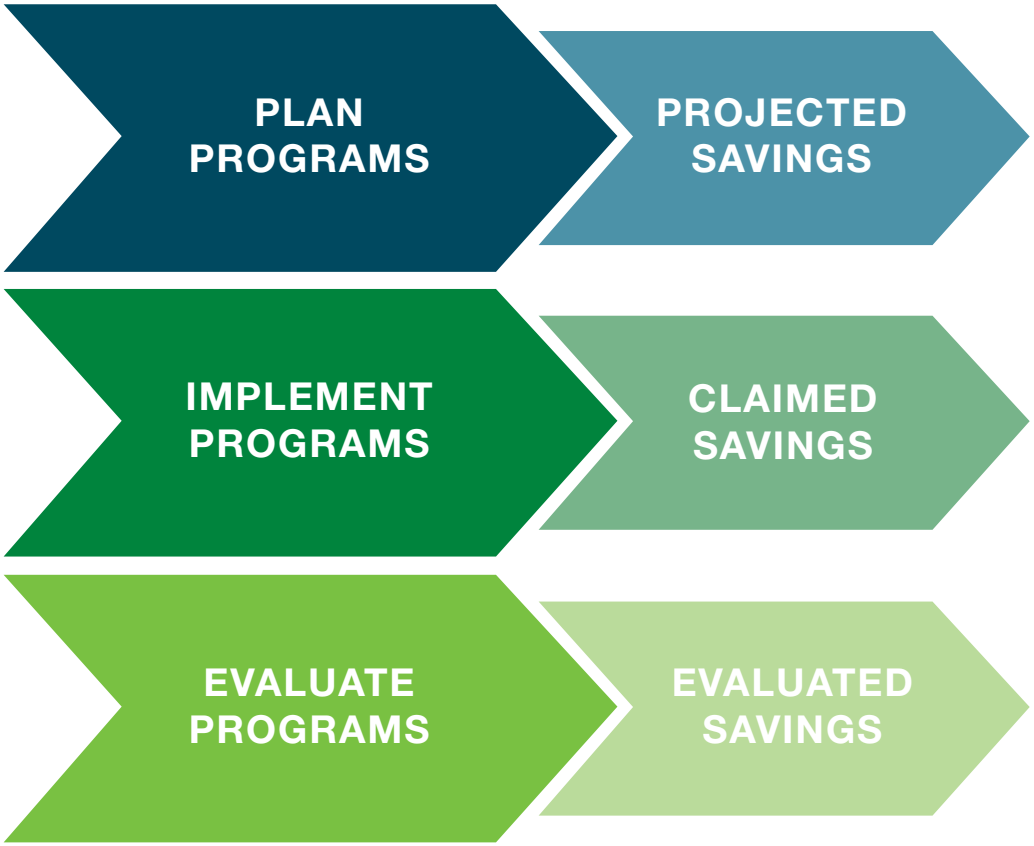
Topics

- Why Evaluate
- EM&V Planning
- EM&V Issues
- EM&V Basics
- Impact Evaluation Methods
- EM&V Frameworks
- EM&V Resources

Why Evaluate

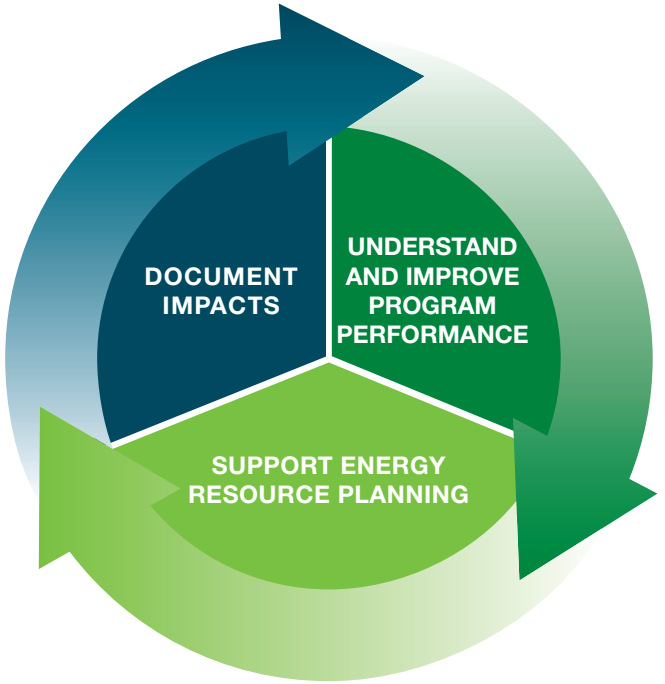


Planning, Implementing, and Evaluating Efficiency Programs



Why Evaluate?

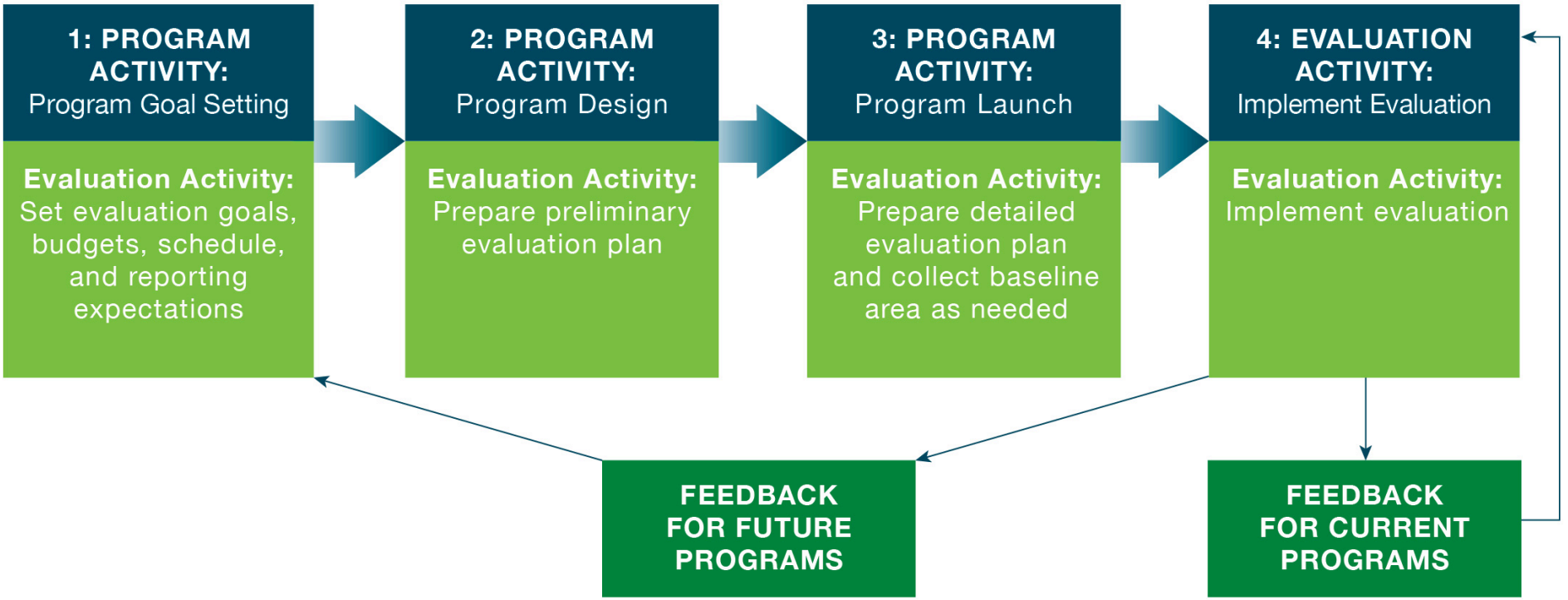
- **Document impacts**: Document the energy savings of projects and programs in order to determine how well they have met their goals; e.g., has there been a good use of the invested money and time? Provide PROOF of the effectiveness of energy management.
- **Resource Planning:** To support energy resource planning by understanding the historical and future resource contributions of energy efficiency as compared to other energy resources. Provide data to support efficiency as a reliable resource.
- **Understand why the effects occurred:** Identify ways to improve current and future projects and programs as well as select future projects. "You can't manage what you don't measure" and "Things that are measured tend to improve."



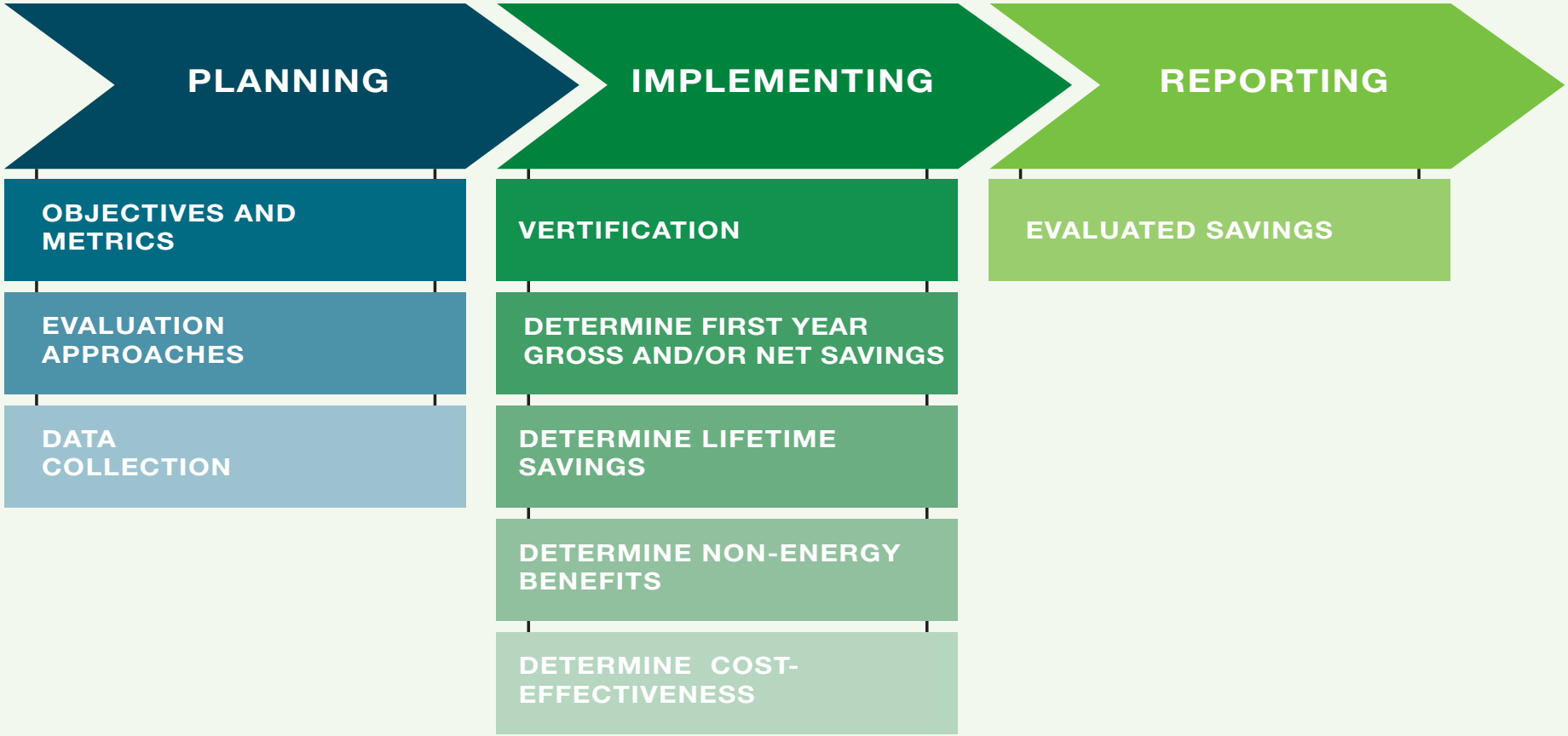
EVALUATION SUPPORTS SUCCESSFUL EFFICIENCY PROGRAMS

EM&V as an Integral Part of Energy Efficiency Delivery

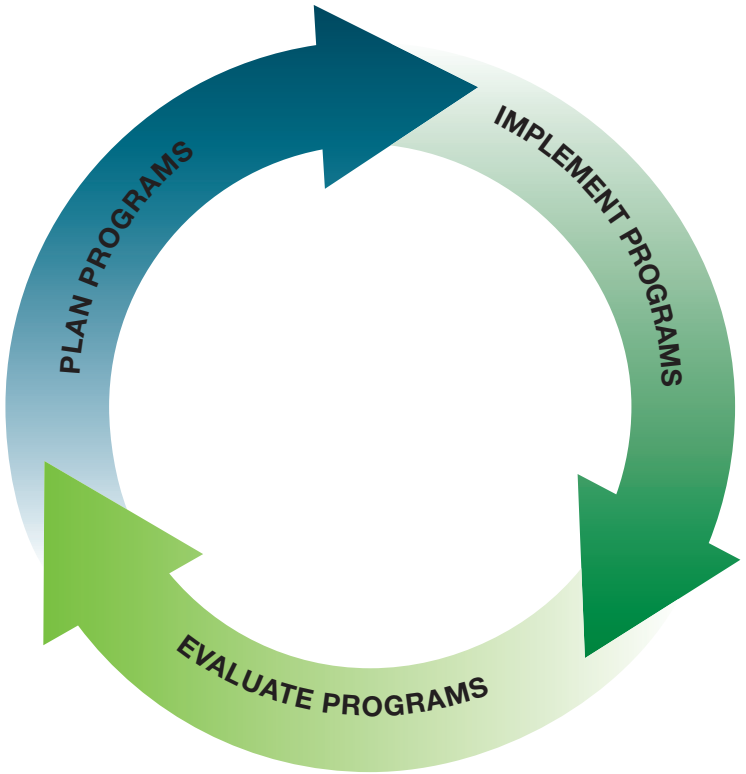
Program/EM&V Workflow



EM&V Workflow



Evaluation is Integral to Planning—Implementation-Evaluation Process

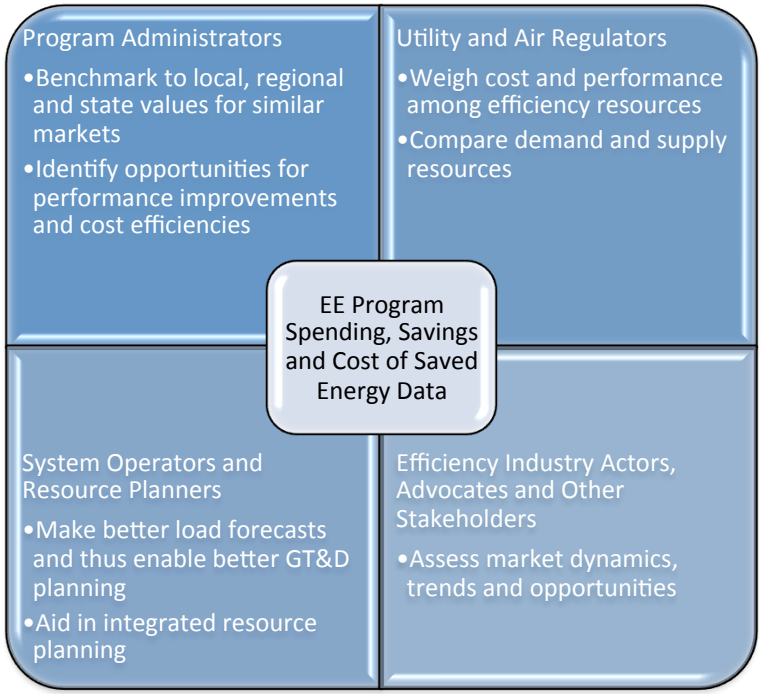


When to Evaluate:

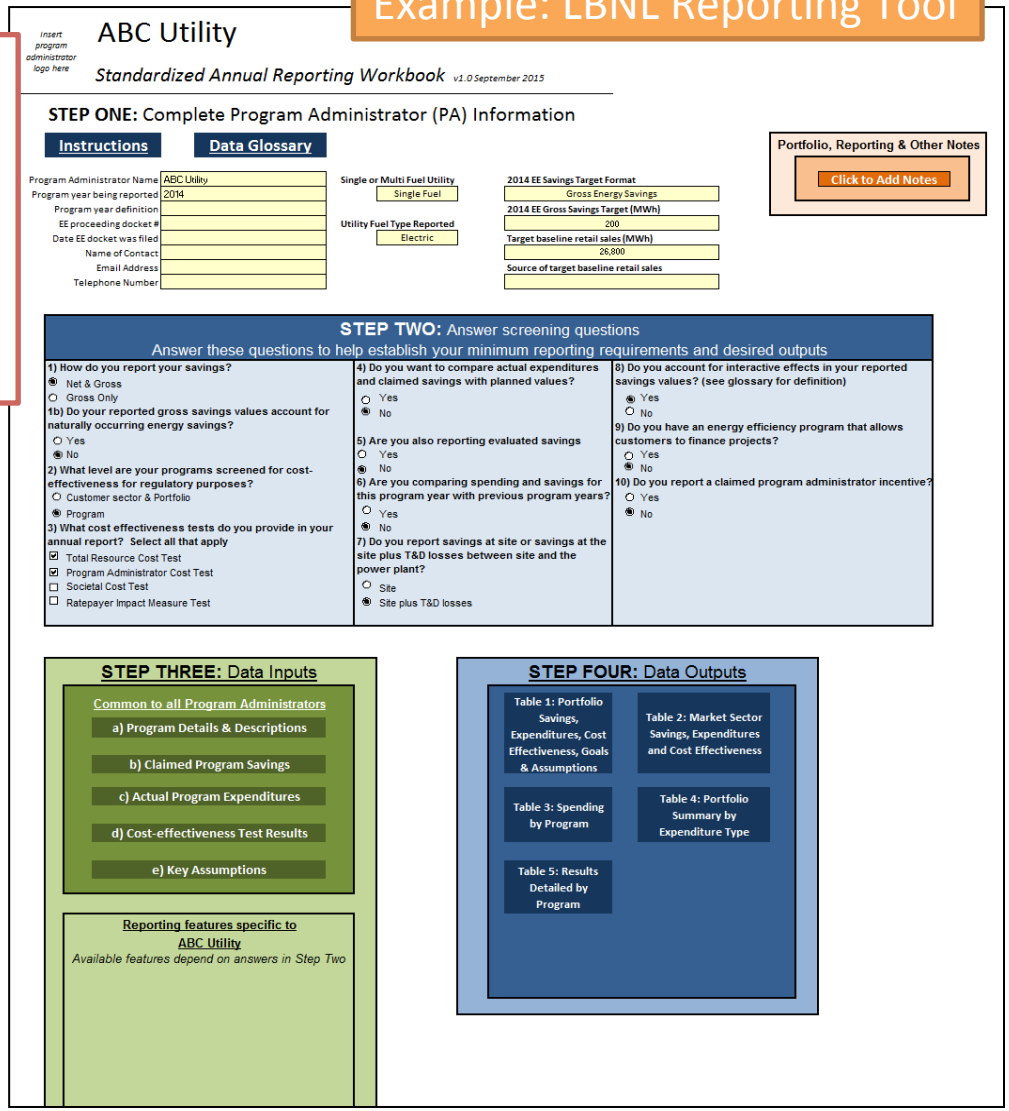
- Evaluations should be produced within a portfolio cycle or very soon after the completion of a cycle
- In a timely manner and provide feedback for:
  - Ongoing program improvement
  - Supporting portfolio assessments
  - Support the planning of future portfolio cycles, load forecasts, and energy resource plans
- Can also be used to inform future evaluations, in particular through updating deemed savings values

Energy Efficiency Reporting

- Consistent tracking of EE program data and EM&V results helps streamline reporting, transparency, and accomplishing program improvements
- Typical data are program costs, savings, cost-effectiveness, participant metrics



Example: LBNL Reporting Tool



EM&V Issues

The Big Issues of EM&V

How good is good enough?

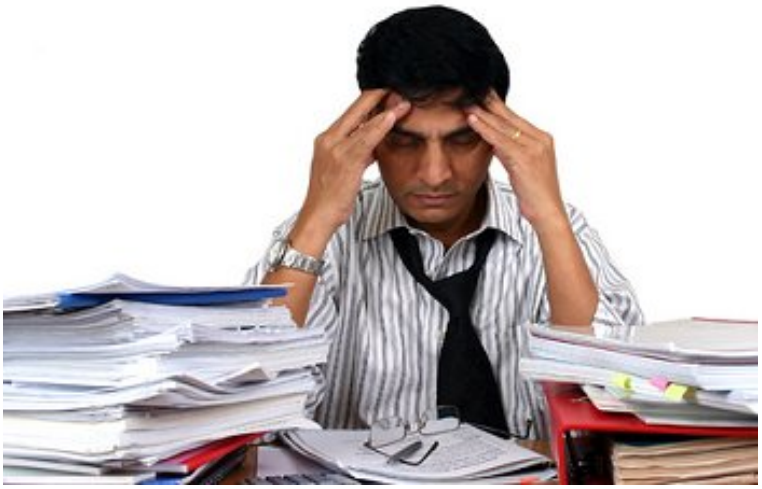
- Fundamental issue of EM&V
- How certain does one have to be of savings estimates and is that certainty balanced against the amount of effort utilized to obtain that level of certainty?
- EM&V investments should consider risk management principles—balance the costs and value of information derived from EM&V (i.e., EM&V should be cost-effective).

As compared to what?

- First – Defining a baseline against which efficiency actions are compared for determining energy savings and whether attribution should be considered—the counterfactual
- Second – Establishing level of performance confidence and risk for efficiency relative to other options meeting energy use, cost, reliability, etc. goals

EM&V is About Risk Management

Energy Savings – Regulator vs. Consumer Perspective Energy Avoidance



- Regulators/utilities/resource planners focus on how much energy would have been consumed if the consumers had not taken the energy efficiency action. They want to know how much energy is avoided. To do so they make adjustments.
- Energy consumers often use the word 'savings' to describe 'cost reductions.' They might make 'technical' adjustments but certainly not 'resource' adjustments.
- Result – savings for consumers might be different than savings determined from a resource/regulatory perspective

EM&V Basics

Evaluation Types – Real Time and Ex-Post

Evaluation Type	Description	Example Uses
Impact Evaluation	Quantifies direct and indirect changes associated with the subject program(s).	Determines the amount of energy and demand saved.
Process Evaluation	Indicates how the procedures associated with program design and implementation are performing from both the administrator's and the participants' perspectives.	Identifies how program designs and processes can be improved.
Market Effects Evaluation	Analyzes how the overall supply chain and market for energy efficiency products have been affected by the program. Market baselines and Potential Studies.	Characterizes changes that have occurred in efficiency markets and whether they are attributable to and sustainable with or without the program.
Cost-Effectiveness Evaluation	Quantifies the costs of program implementation and compares them with program benefits.	Determines whether an energy efficiency program is a cost-effective investment compared with other programs and energy supply resources.

FOCUS OF THIS PRESENTATION IS IMPACT EVALUATION – BUT THE FOLLOWING FEW SLIDES INTRODUCE THE OTHER STUDY TYPES

Process Evaluations

- Recommend ways to improve a program's efficacy and effectiveness
- Frequency:
  - For a new program
  - Whenever there are major changes in the program
  - Or after 2-3 years

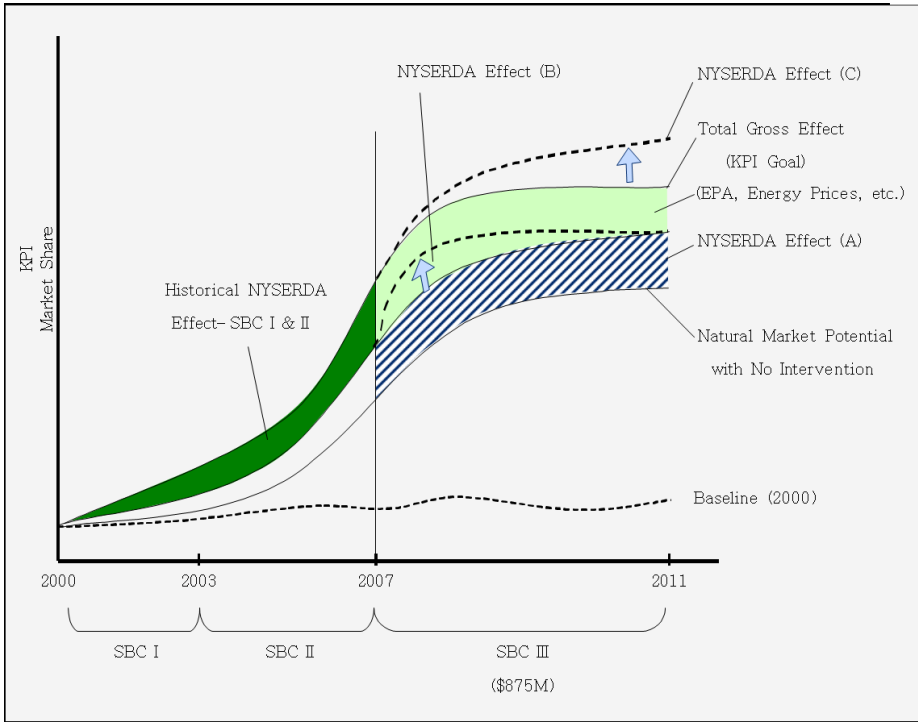
Process evaluations are particularly valuable when:

- The program is new or has many changes
- Benefits are being achieved more slowly than expected
- There is limited program participation or stakeholders are slow to begin participating
- The program has a slow startup
- Participants are reporting problems
- The program appears not to be cost-effective

Market Studies

- **Market Baseline -** studies look at the broader market for EE products and services and establishes existing levels of efficiency—done before program

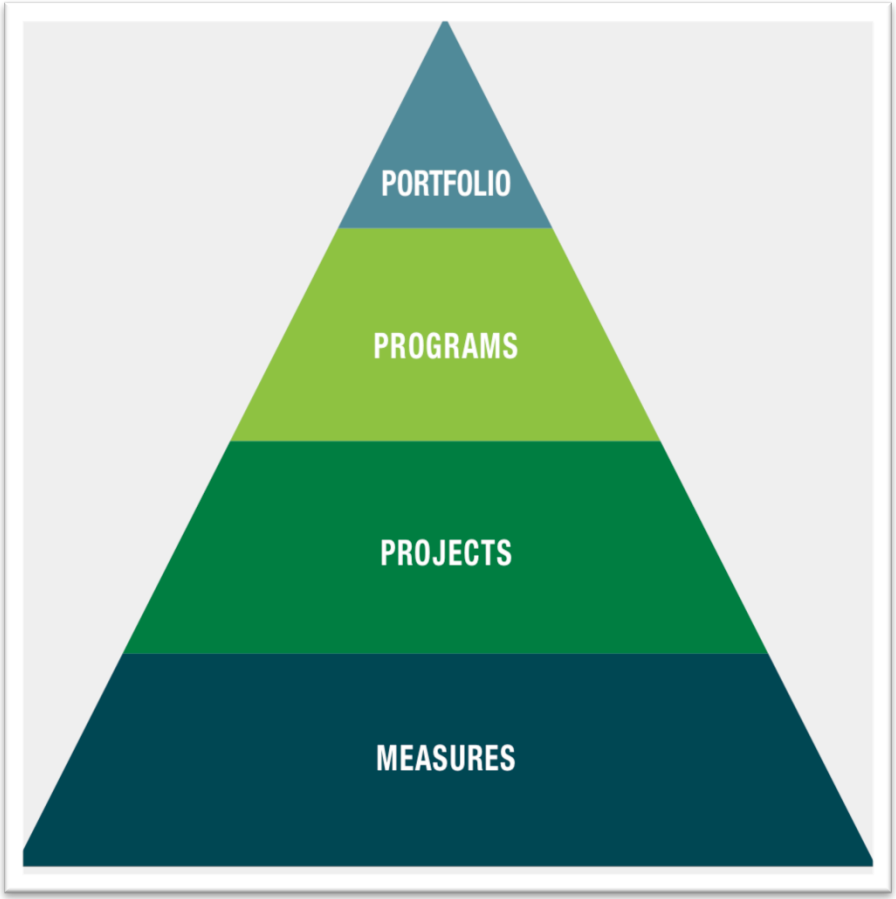
- **Market Effects -** look at the broader market effects of EE programs (e.g., sometimes rebate programs may increase product availability and drive product prices down, resulting in…)



IMPACT EVALUATIONS

EM&V Definitions

- Evaluation - Performance of studies and activities aimed at determining the effects of a program or portfolio.
- Measurement and Verification - Data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from individual sites or projects. M&V can be a subset of program evaluation.
- EM&V - The term "evaluation, measurement, and verification" is frequently seen in efficiency evaluation literature. EM&V is a catchall acronym for determining both program and project impacts.



Two Components to Impact Evaluation:

1. Verify potential to generate savings
2. Determine savings

Example: Lighting Retrofit

Potential to Save:

Before: 60 Watts/fixture

After: 13 Watts/fixture

Savings:

Savings determined based on operating hours and lifetime of lamps

Example: New Car

Potential to Save:

Before: 10 MPG

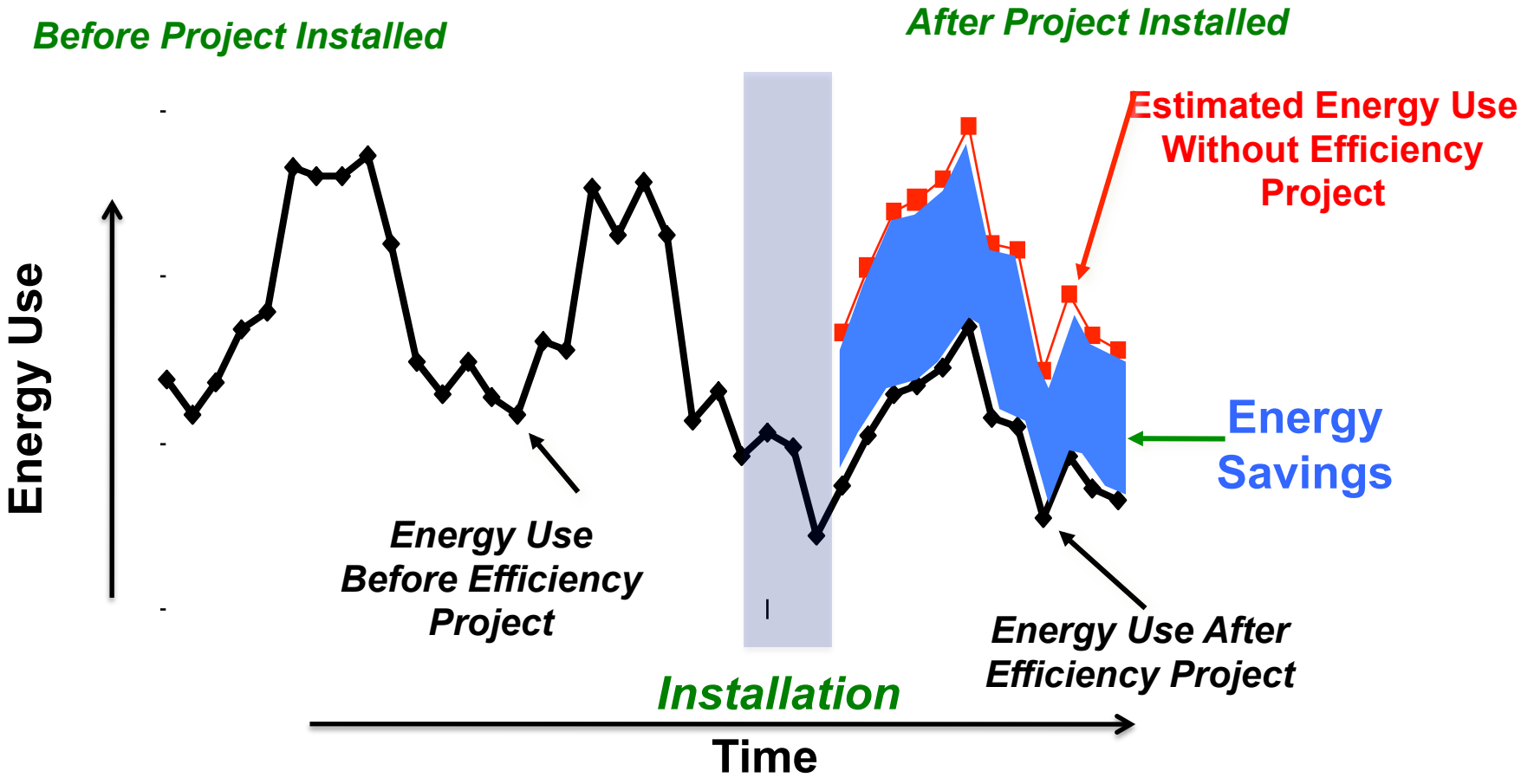
After: 50 MPG

Savings:

Savings determined based on how many miles driven and for how many years

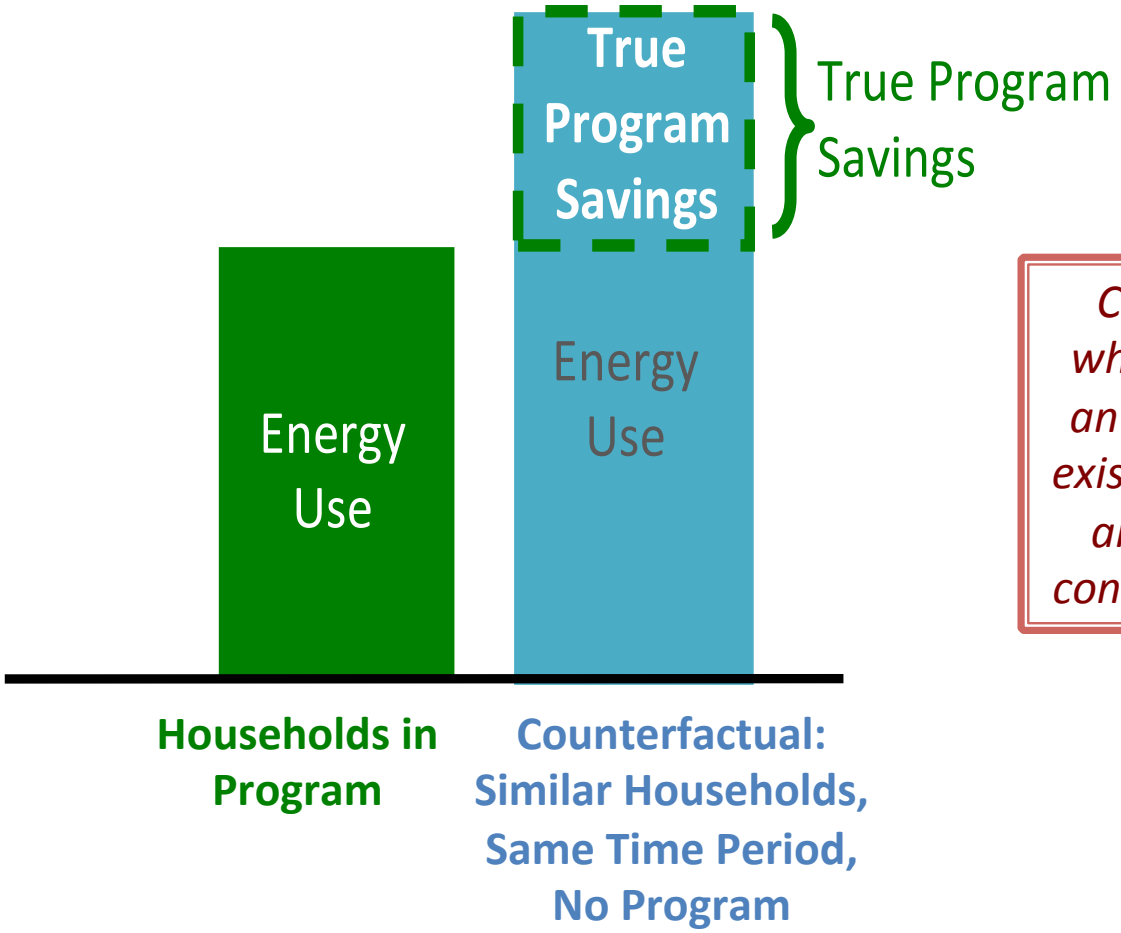
Savings Cannot Be Measured -

They Are Estimated



Graph of Energy Consumption Before, During And After Project Is Installed

Counterfactual



Counterfactual analysis occurs when a person modifies a factual antecedent (a thing or event that existed before or logically precedes another) and then assesses the consequences of that modification.

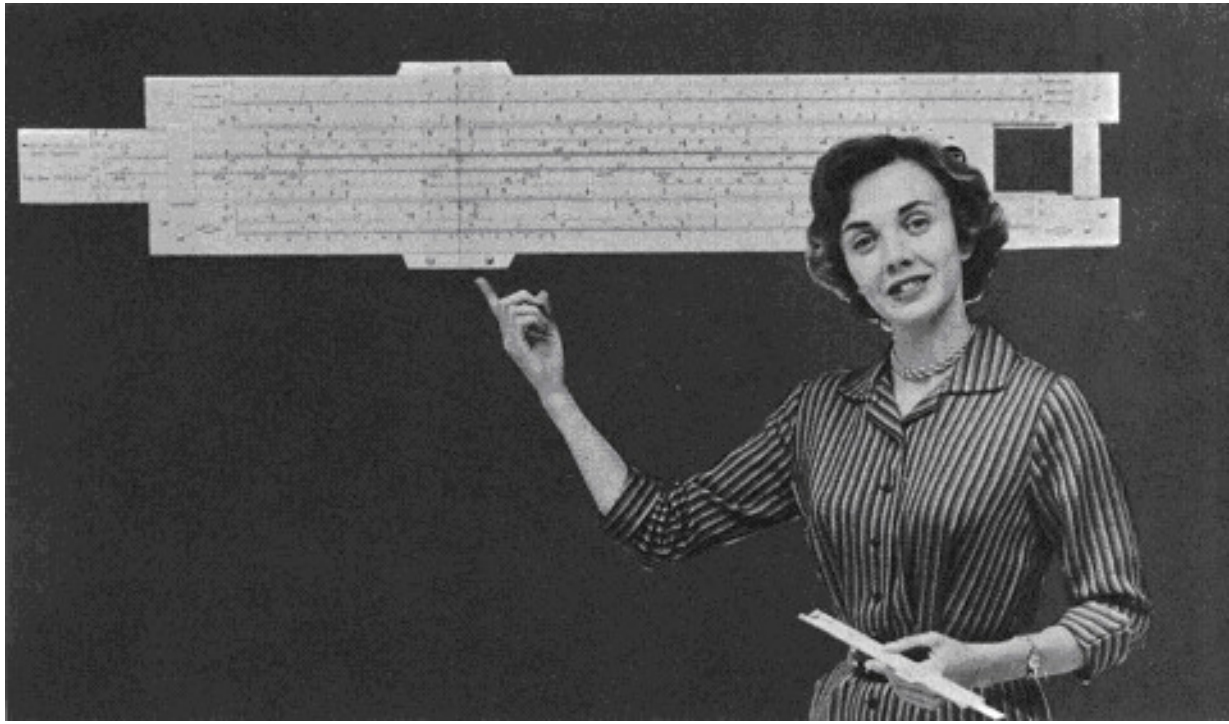
Baseline and Adjustments

- **Savings = (energy use without program, i.e. the baseline) – (energy use with program) +/- "adjustments"**
- **Baseline:**
  - Baseline definition: conditions (including energy consumption) that would have existed without implementation of the EE activity.
  - The key challenge with quantifying EE savings is the identification of an accurate baseline from which to determine energy savings.
- **Adjustments:**
  - Individual building changes: Renovations, home occupants (e.g., new baby), business activities (e.g., number of employees, operating hours), plug loads
  - Broader changes: weather, economy, energy prices, other programs

Impact Evaluation Metrics

- **Gross Savings:** The change in energy consumption and/or demand that results directly from program-promoted actions taken by program participants regardless of the extent or nature of program influence on their actions.
- **Net Savings:** Refers to the portion of gross savings that is attributable to the program. Attributing changes to one cause (i.e., a particular program) or another can be quite complex.
- **Non-Energy Benefits:** Impacts associated with program implementation or participation. Can be positive or negative. Some examples include: avoided emissions and environmental benefits, productivity improvements, jobs created and local economic development, reduced utility customer disconnects, higher comfort and convenience.

Impact Evaluation Methods



Approaches for Determining Gross Energy Savings

- Deemed (stipulated, default) values or calculations
  - Use historical and verified data to projects and/or measures with correct applicability conditions.
  - Typically applied to "prescriptive" or "standard" measures
- Comparison group EM&V methods
  - Conduct Statistical analyses of large volumes of metered energy usage data.
  - Typically applied to "mass market" and "residential" programs and with a control group versus a participant group
- Project-based measurement and verification (M&V)
  - Determine savings from a sample of projects.
  - These savings are then applied to all of the projects in the program.
  - Typically applied to "calculated" or "custom" measures

All of these approaches can take and are taking advantages of advances in "big data," load monitoring technology and analytical tools – "EM&V 2.0"

Deemed Savings

- **Deemed Savings Value**: (*Stipulated Savings Value, Unit Energy Savings).* Estimate of energy or demand savings for installed EE measure 'per unit':
  - Used for well understood and documented EE measures
    - For example: energy-efficient appliances such as washing machines, computer equipment and refrigerators, and lighting retrofit projects with well-understood operating hours
  - Has been developed from reliable data sources and analytical methods
  - Is applicable to the situation being evaluated

- **Deemed Savings Calculation**: An agreed-to (stipulated) engineering algorithm(s) used to calculate the energy and/or demand savings associated with an installed EE measure(s)

- Common sources of deemed savings values are previous evaluations and studies that involved actual measurements and analyses
- With deemed savings, the per-unit MWh values are determined and agreed to by parties prior to EE implementation
- When deemed savings are used to quantify MWh savings, a separate verification process is needed to confirm the quantity of units installed

Deemed Savings and Algorithm Resource Databases – AKA "TRMs"

- TRM is a resource (document, database, website) that includes information used in program planning, reporting and evaluating of EE programs which can include:
  - Energy efficiency measures metrics or characteristics (e.g. ,savings)
  - Engineering algorithms to calculate savings
  - Specific parameters needed to calculate savings
  - Factors for applying to calculated savings (e.g., net-to-gross ratios)
  - EM&V protocols and guidelines to be referenced
- Typically include documentation of:
  - Assumptions (e.g., baselines) used to prepare values
  - Calculations of values
  - When (what appropriate applications) to apply values and algorithms
- Provide a common reference for utility program managers, implementers, evaluators, and regulators
- States (or regions) can develop their own TRMs, but will often borrow information from other states that is applicable

Deemed Savings - risk and rewards

They are used a lot for gross and net savings—they provide certainty!

But, Must Be Used With Caution

- Have to be applied where appropriate only! (Both the measure and the project characteristics need to match the assumptions.)
- The use of deemed values in a savings calculation is an agreement to accept a stipulated value, irrespective of what actually "happens."
- When using deemed values, it is important to realize that technologies alone do not save energy—it is how they are used that saves energy.

Comparison Group EM&V - Statistical Data Analysis

- Large-scale data analysis applies a variety of statistical methods to measured facility energy consumption meter data (almost always whole-facility utility meter billing data) and independent variable data to estimate energy savings.
- These methods are generally used to estimate program-level savings, not facility- or project-level savings.
- Specifically, comparison group EM&V methods determine program savings based on the differences in electricity consumption patterns between a comparison group and the program participants.
- Comparison group approaches may involve:
  - Randomized control trials (RCTs) using non-participants as control group
  - Quasi- experimental methods using non-participants or participants (time series) as control group; the time series is most common
- Usually net savings, sort of….
- Because the effects of implemented measures are reflected in the observed participant-comparison differences, separate verification is not required.

Project –Based Measurement and Verification (M&V)

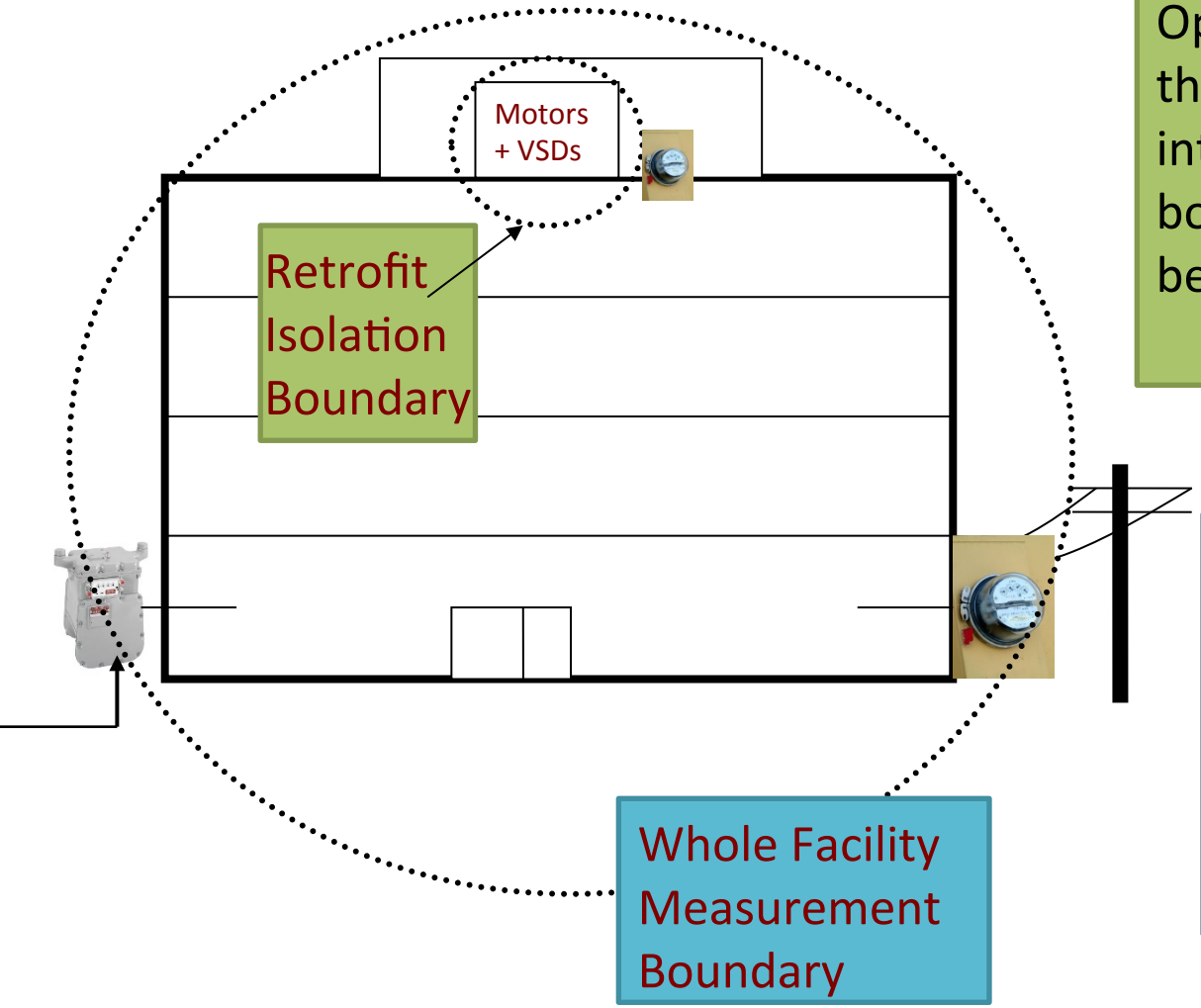
- M&V is determining gross savings for individual projects or measures
- To obtain program savings using M&V, either:
  - Determine the savings of each project in a program—for example, for a program with a limited number of large industrial or commercial projects
  - Select a representative sample of projects and apply the sample projects' savings to the entire population, i.e., the program

M&V methods are defined in the International Performance Measurement and Verification Protocol (IPMVP); the leading international energy efficiency M&V protocol:

- Owned by "EVO" —non-profit organization—with document drafting and peer review technical committees
- IPMVP translated into 10 languages and is used in more than 40 countries
- Since going online, there have been more than 25,000 downloads of the IPMVP

More information can be found at www.evo-world.org

IPMVP: Retrofit Isolation and Whole Facility M&V



The Retrofit Isolation Options: Option A or B - Addresses only the retrofitted system—ignores interactive effects beyond the boundary (although these may be independently addressed)

The Whole Facility Options: Option C or D - Addresses all effects in the facility—retrofits AND other changes (intended and **un**intended)

A "Typical" Combination for Determining Gross Savings

- Set of prescriptive programs use deemed savings values for savings (e.g., residential CFLs and insulation, commercial ventilation motors, commercial building lighting)
- Set of custom programs use calculated ex-ante savings estimates and 100% site verification with spot measurements to confirm assumptions (e.g., commercial HVAC measures)
- Another set of custom programs use M&V savings analyses (Options A, B, C and/or D), defined in a guideline, on a census of projects (e.g., industrial process measures)
- Residential weatherization program uses large scale billing data analyses with comparison groups

Verification

Recall that there are two parts to EM&V: (1) determining potential for savings and (2) determining actual savings

- Usually some physical assessment of at least a sample of the individual projects is done.
- Ensures that the measures installed are to specification and thus have the potential to save.
- Potential to generate savings can be verified through observation, inspections, and spot or short-term metering conducted immediately before and after installation.
- Sometimes, all you need is verification and the use of a deemed savings value.

NET SAVINGS

Net Savings - Factors

- Free riders: program participants who would have implemented the program measure or practice in the absence of the program
  - Can be total, partial, or deferred.
- Spillover: reductions in energy use caused by the presence of the efficiency program, beyond the program-related gross savings of the participants. Can be participant and/or non-participant spillover.
- Market effects: change in the structure of a market or behavior of participants in a market that is reflective of an increase (or decrease) in the adoption of energy-efficient products, services, or practices

Approaches For Determining Net Savings

- Stipulated net-to-gross (NTG) ratios
- Self-reporting surveys and enhanced self-reporting surveys
- Expert panel interviews – e.g., trade allies
- Large-scale consumption data analysis approaches
- Cross-sectional (point in time, different populations) and longitudinal (over time, same population) market studies
- Top-down evaluations (or macro-economic models)

NON-ENERGY IMPACTS

Non-Energy Impacts (NEIs)

NEIs

- NEIs can be categorized as those accruing to:
  - utilities (energy providers)
  - society as a whole
  - individual participants
- Can be positive or negative
- For some consumers, they might exceed energy benefits

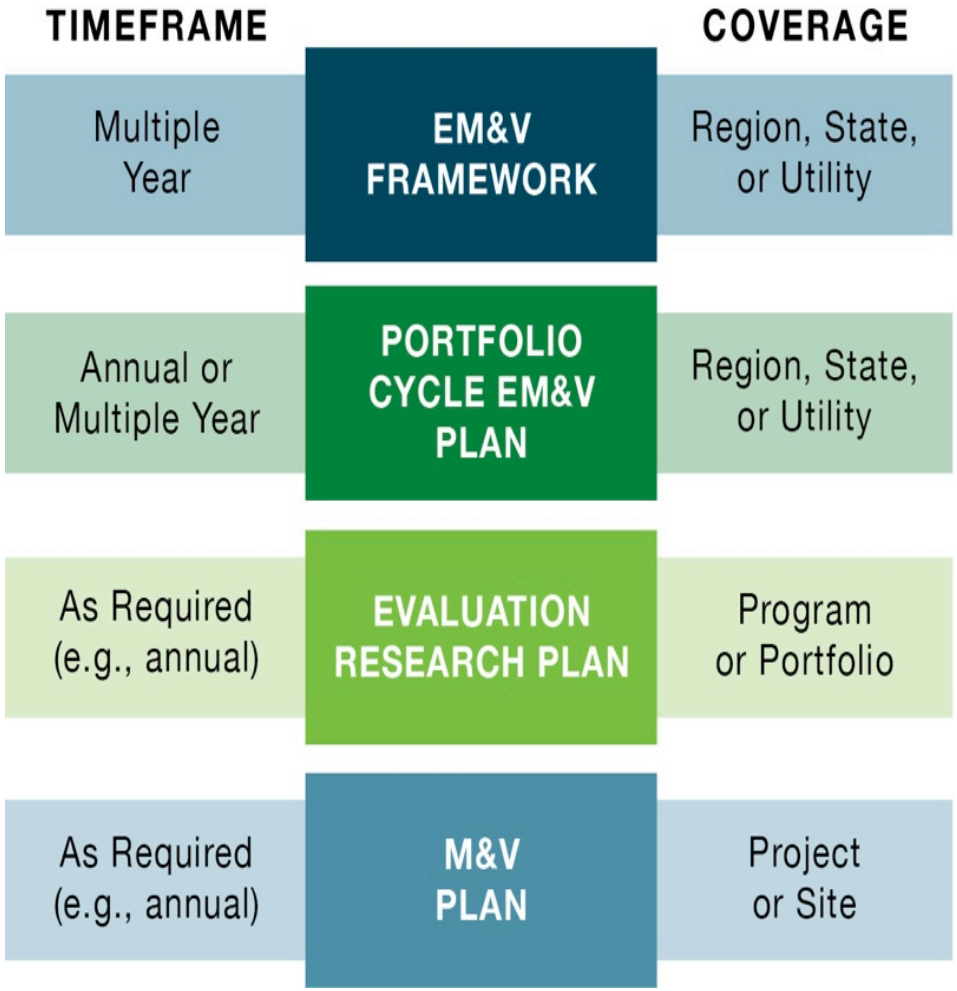
Measuring NEIs

- **Measurement of benefits.** These methods are used with benefits that can be directed, measured, or calculated, such as water savings
- **Modeling.** These methods include macroeconomic modeling and analysis tools that look at broader societal impacts such as job growth or modeled estimates of emissions impacts
- **Surveys.** These involve surveys with consumers, contractors, utilities, etc.
- For avoided air emissions, emissions factors modeling can be used

EM&V Frameworks

Structure for Defining Evaluation Activities

- EM&V Framework – Primary document that lays out top level structure. *This is perhaps the principle document that all stakeholders can focus on and provide high level input.*
- Annual Plans – Indicates major activities that will be conducted during the evaluation cycle
- Evaluation Research Plans – Created for the major EM&V activities
- Site Specific M&V Plans – For custom project sites that are analyzed and inspected



EM&V Framework

- Primary document that lays out key aspects of evaluation such as:
  - Definitions
  - Evaluation principles
  - Allowable approaches
  - Metrics for determination of gross and/or net savings
  - Reporting requirements
  - Schedules
  - Roles and responsibilities of various entities
- Tends to be "fixed" for several years, but can be updated periodically
- Sets expectations for the content and scope of subordinate evaluation documents, such as a portfolio cycle EM&V plan
  - Whereas the subordinate EM&V documents contain a higher level of detail and apply to narrower time frames, the EM&V framework is the principal document on which all stakeholders can focus and provide input

EM&V Framework – Typical Topics

1. What are the consumer, policy and/or regulatory goals that are basis for the efficiency programs and thus the EM&V:
   - Objectives
   - Metrics

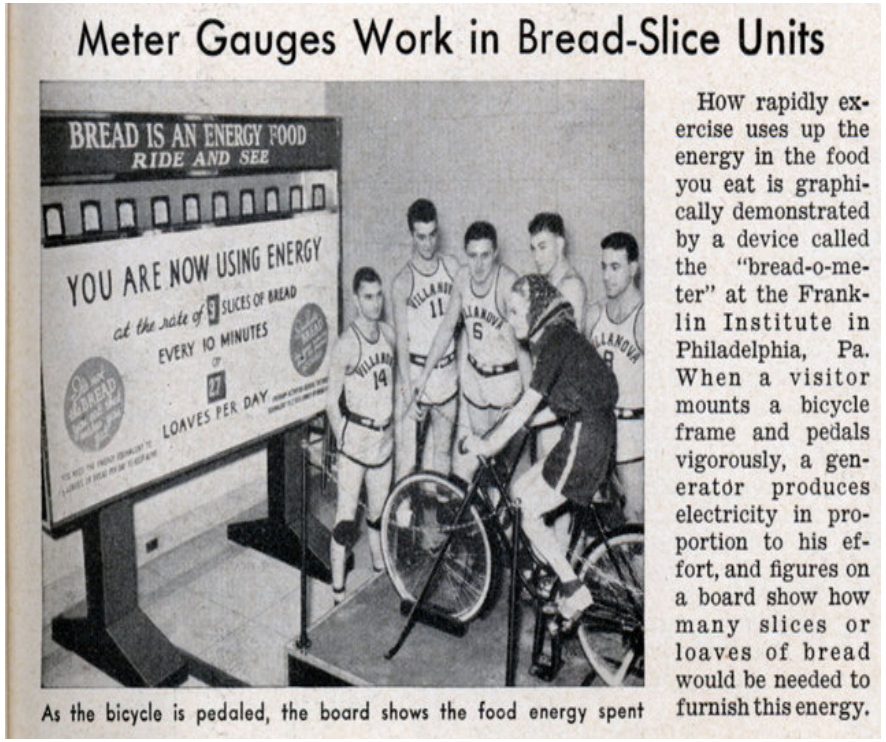
   that support the program policies and/or regulations?
2. What are the evaluation principles that drive the effort?
3. What is the scale and budget of the evaluation effort?
4. Who will administer and conduct the evaluations
   - Is independence important, how is an independent evaluation defined?
   - What are the relative EM&V roles between implementers, evaluators, regulators, stakeholders, and others?
5. Is performance determined on the basis of net or gross savings? What factors are included in defining net savings?

EM&V Framework Questions, continued

6. What are the baselines against which savings are determined?
7. What is the reporting "boundary"?
   - Are transmission and distribution (T&D) losses included?
   - How "granular" will the results be – annual, hourly, seasonal?
   - How is persistence of savings determined?
8. What are the schedules for implementing the evaluation and reporting; what is included in reports?
9. What impact evaluation approaches will be used?

EM&V Framework Questions, continued

10. What are stakeholder roles and how do they participate?
11. What are expectations for savings determination certainty (confidence and precision)?
12. Which cost-effectiveness tests will be used—and thus what data are needed ?
13. How are evaluated savings estimates applied—looking back/ going forward?
14. What are the data management strategies?
15. How are disputes addressed?



Example EM&V Framework Contents - Texas

(1) Objectives

(2) Principles

(3) EM&V oversight and contractor

(4) EM&V Activities

(5) EM&V approaches

(6) Technical Reference Manual

(7) Utilities prepare Projected Savings and Claimed Savings value and EM&V Contractor prepares Evaluated Savings values

(8) Baselines definitions

(9) Applying recommendations from EM&V Contractor

(10) Utilities cover EM&V contractor costs

(11) Data access for EM&V and confidentiality

(12) Schedules

EM&V Resources

EM&V Resources and Support

About 40 years of experience with EE EM&V

- An EM&V industry of professionals exists – for example see: www.evo-world.org and www.iepec.org
- Numerous state, national and international guidance documents and protocols exist

State and Local Energy Efficiency Action Network (SEE Action), facilitated by the U.S. Department of Energy/U.S. Environmental Protection Agency, as well as DOE and EPA on their own have and are continuing to sponsor a number of EM&V projects, for example:

- Uniform Methods Project
- Data Warehouse Project
- Model Impact Evaluation Guide
- Guidance for Evaluating Behavior Programs
- EM&V webinar series (with recordings)

http://www1.eere.energy.gov/seeaction/evaluation.html

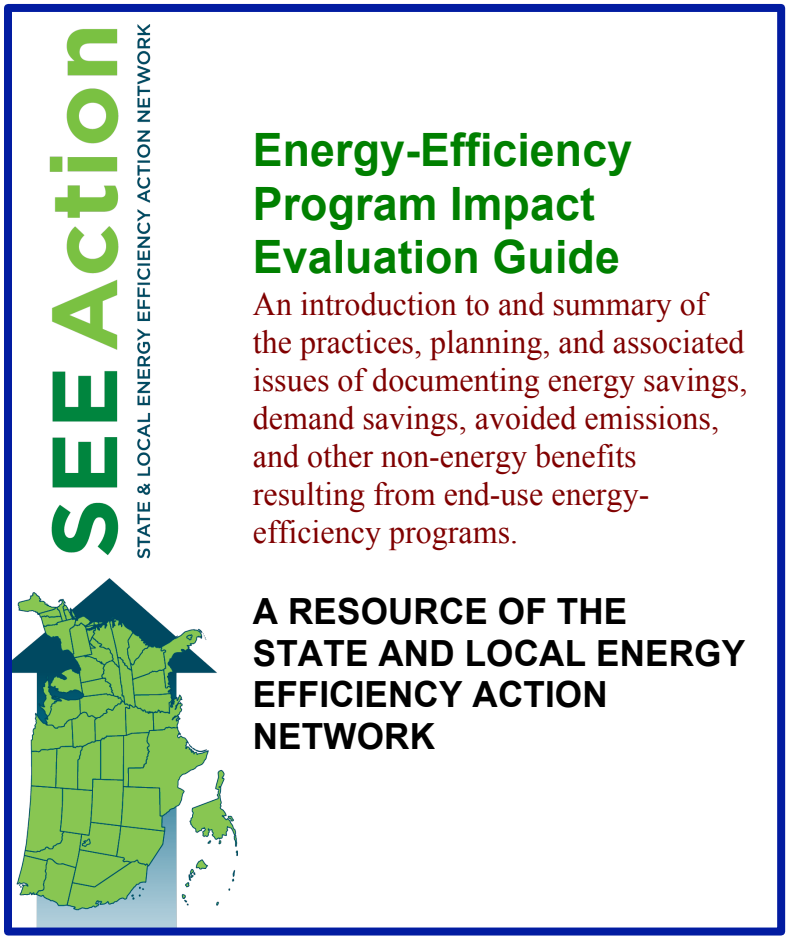
SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

2012 SEE Action Impact Evaluation Guide

- Describes common terminology, structures, and approaches used for determining (evaluating):
  - energy and demand savings
  - avoided emissions
  - other non-energy benefits
- Does not recommend specific approaches—it provides:
  - context
  - planning guidance
  - discussion of issues

http://www1.eere.energy.gov/seeaction/

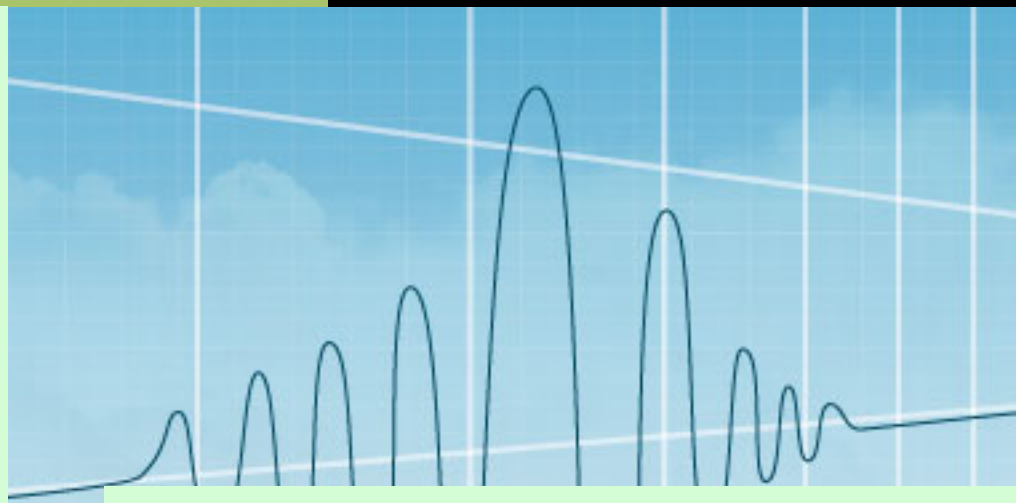


2012 SEE Action Impact Evaluation Guide Contents

Part	Chapters	Intended Audience
Part 1	Executive Summary	Readers interested in a brief summary and introduction to impact evaluation
Part 2	Chapter 1: Introduction Chapter 2: Energy Efficiency Program Evaluation Overview Chapter 3: Impact Evaluation Basics	Readers who want an overview of evaluation and the key aspects of impact evaluation
Part 3	Chapter 4: Calculating Energy Savings Chapter 5: Determining Net Energy Savings Chapter 6: Calculating Avoided Air Emissions	Readers who want additional detail on impact evaluation approaches – **deemed savings, M&V, large-scale consumption data analysis**
Part 4	Chapter 7: Impact Evaluation Considerations Chapter 8: Impact Evaluation Planning	Program implementers, evaluators, and managers/regulators of evaluations looking for guidance on key evaluation issues and planning of evaluations as well as readers with a background in evaluation may want to go directly to these chapters
Part 5	Appendix A: Glossary Appendix B: Other Evaluation Categories and Approaches—Market, Process, Cost-Effectiveness Appendix C: Resources References	Readers interested in standard energy efficiency evaluation **definitions** and **reference materials** as well as summaries of **process, market evaluations, cost-effectiveness analyses and top-down evaluation**

U.S. DEPARTMENT OF ENERGY

- Addresses common residential and commercial efficiency measures
- Step-by-step calculations for determining gross, first-year savings using M&V approach
- Also cross cutting chapters on some EM&V topics (net savings, sampling, metering, persistence, peak savings)
- Adoption is voluntary
- http://energy.gov/eere/about-us/ump-home



DOE Goals

Strengthen credibility EE savings calculations

Provide clear, accessible, step-by-step protocols

Support consistency and transparency

Reduce costs of EM&V

Allow for comparison of savings

UNIFORM METHODS PROJECT

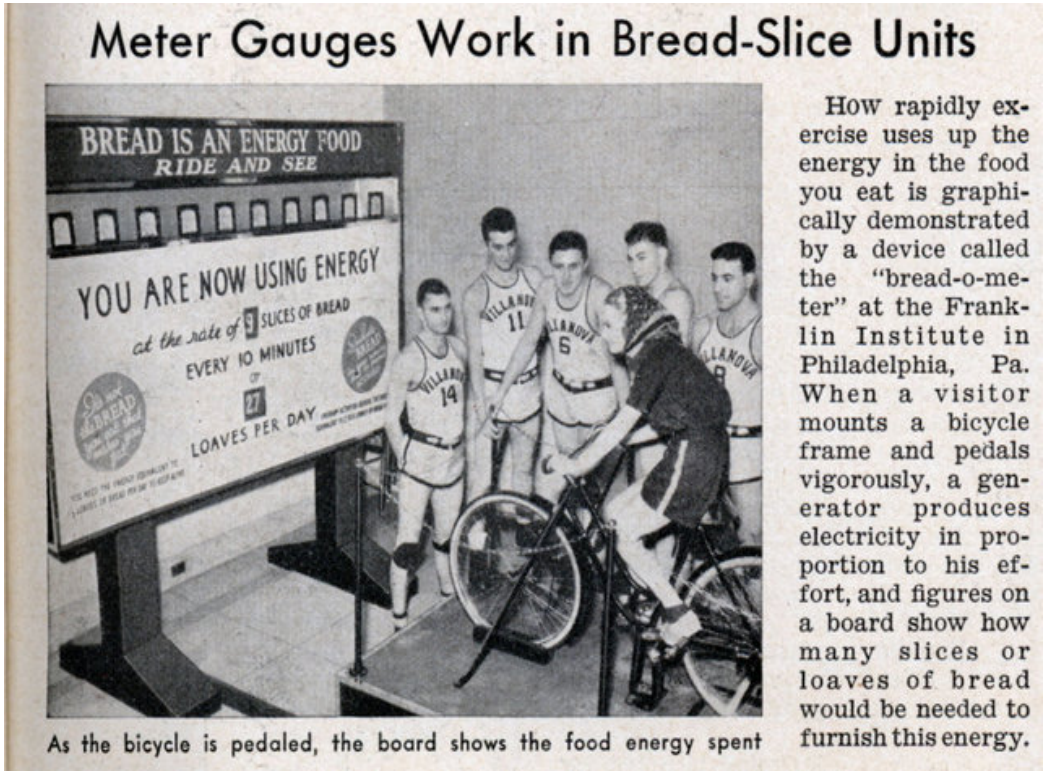
Jointly managed by the DOE Office of Electricity Delivery and Energy Reliability and the Office of Energy Efficiency and Renewable Energy

Discussion/Questions

From Albert Einstein:

"Everything should be as simple as it is, but not simpler"

"Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted"



Contact:

Steve Schiller
Senior Advisor, LBNL
SRSchiller@lbl.gov

Extra Slides

EXAMPLES OF FRAMEWORK ISSUE CONSIDERATIONS

Examples of Evaluation Objectives

Efficiency Program Objectives

- The "usual suspects"
  - Demand savings Energy savings
  - Cost-effectiveness First year or life-cycle?
- Other co-benefits (examples)
  - Emissions avoidance
  - Jobs
- "Milestones" (examples)
  - Homes served
  - People trained
- Market transformation (examples)
  - New businesses
  - New products offered

EM&V Objectives

- Program objectives define what needs to be documented (measured, reported)
- Their value and risk in getting the metric's value wrong defines level of effort
- Specific examples of questions:
  - How will the information/metrics be used?
  - What level of transparency is required and for who?
  - What are requirements for reporting results to Commission, stakeholders?
  - How do individual utility results fit into any statewide analyses?

Examples of Evaluation Principles

- Evaluators should be impartial in their work and not have their compensation tied to the magnitude of results
- Evaluators are expected to follow ethical guidelines (e.g., American Evaluation Association http://www.eval.org/)
  - Systematic inquiry
  - Competence
  - Integrity/honesty
  - Respect for people
  - Responsibilities for general and public welfare
- Transparent methods to estimate load impacts are reviewed in public forum to increase quality and reliability
- Evaluation planning process identifies the types of evaluation information that is crucial to different stakeholders
- Take advantage of work done elsewhere
- Expert review of evaluation design in planning phase
- All key assumptions used by program planners are eventually verified in evaluations
- Savings values are determined on most likely, versus most conservative or optimistic
- Ensure procurement process used to select evaluation contractors is timely and flexible
- Focus evaluation dollars and efforts on areas of largest/ most important uncertainty
- Over time, use impact evaluation used to refine input assumptions used in savings estimation and improve programs

Basics

- Integral to the portfolio cycle
- Useful retrospective analyses
- Adequate resources
- Completeness and transparency
- Relevance and balance in risk management, uncertainty, and costs
- Consistency

Baseline Options for Efficiency Programs

Program Category for Purposes of Baseline Determination	Existing Conditions Baseline	Codes and Standards Baseline	Common Practice Baseline
Early replacement or retrofit of functional equipment still within its current useful life; Process improvements	X - Existing conditions baseline for the remaining life of what is replaced	X - C&S baseline for the time period after the remaining life of the replaced equipment	X - Common practice baseline for the time period after the remaining life of the equipment
Replacement of functional equipment beyond useful life		X	X
Unplanned replacement for (of) failed equipment		X	X
New construction		X	X
Non-equipment based programs (e.g., behavior-based and training programs)			X – What control group would be doing in the absence of the program

Budget, Scale, and Quality of EM&V

Issues when setting the scale

- How large is the program?
- New program with uncertain savings or an established program?
- Is the program likely to be expanded?
- How certain an estimate of energy and demand savings are required?
- Do savings need to be attributed to certain programs?
- How long is the program cycle?
- What is the time period for reporting savings (annual, monthly, etc.)?
- What are the reporting requirements and who must review and approve results?
- What sample sizes are required to achieve the desired precision/confidence?
- Are non-energy impacts to be analyzed?

Process for setting the scale

- What is typically done:

The budget is set, everything flows from that budget based on experience and best practices

- What is good to do:

Provide answers to the issues and questions raised in this presentation

Conduct an iterative process of costing out approaches and risk analysis till the right balance is reached

- In practice:

Most of the first and some of the latter within context of overall budget

Who Does What EM&V Activities

Common factors for deciding:

- Realities and perceptions of conflict of interest
- Resources and capability to manage and timely implement
- Resources to conduct (major issue in industry is lack of human EM&V capacity)

Examples of Who Does What:

Impact

- Administrator (utility) conducts EM&V with internal staff
- Administrator (utility) conducts EM&V with third-party consultants
- Commission (or Commission surrogate) conducts EM&V with third-party consultants
- Administrator (utility) conducts EM&V and Commission (or Commission surrogate) conducts review/audit

Process

- Almost always done by administrator (utility)—with internal staff or more often third-party consultants

Market

- Almost always done by administrator (utility)—with internal staff or more often third-party consultants—but can be initiated by others particularly if looking at statewide or regional market analyses (good to combine resources)

Planning

- EE potential studies—can be done as part of utility or regional resource planning